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On the relation between insects and the forms and character of flowers.

THOMAS MEEHAN.

Surely all must concede that those who are industriously collecting and recording facts in relation to the visits of insects to flowers are engaged in a work of great value to science. To my mind one of the weaknesses of these observers is to attach too much importance to their work. In the enthusiasm of useful discovery, it becomes difficult to believe that the facts noted by other observers can have a value equal to our own, and we must deal leniently with the friends whose weakness induces them to belittle or ignore the work of others in parallel lines. It will do no harm, while so much is being claimed for the influence of visiting insects on the form and general behavior of flowers, to note a few propositions which have been presented and proven during the past few years, and in which I think my own work has had a place, which surely show that insects are not the all important factors in many given results credited to them.

1. Many changes in the forms of flowers are attributed to the insect's touch, and it is claimed that modification has slowly proceeded through the ages responsive to these insect habits; but it is surely not denied, at this day, that change does not occur by slow modification, but by leaps, and often by leaps of a gigantic kind. Insects can do nothing here.

2. It has been shown that in the earlier stages of fertilization there is no reason why a flower may not be indifferently of either sex, and that the final determination of this matter is a question of nutrition, with which an insect can have little to do.

3. There is no question that a flower proterandrous in one district or season may be proterogynous in another—that it is wholly a matter of meteorological influence, in which an insect has no place.

4. Fertility in plants is not wholly a matter of pollination. Some plants are barren though the pollen tubes can be traced to the ovules, and myriads of fruit resulting from perfect fertilization fall in an early stage. Nutrition is of as

much importance as fertilization by the pollen in an early stage¹ in securing ultimate fruit.

5. The floral parts are modified leaves—modified by a process that lessens their vital power—and color in these floral parts is an attribute of weakening vital power, having no relation to the visits of insects.

6. Plants wholly dependent on insects for fertilization are all perennials. An innumerable number of the flowers of these plants fall unfertilized, and but for their being perennials, many species so dependent would have long since disappeared.

7. All annuals, though in some cases so arranged that cross-fertilization may occur, can self-fertilize when cross-fertilization fails. In fact annuals are in a general sense self-fertilizers. In almost all cases annuals have every flower fertile.

8. Flowers do not abhor own-pollen, as the proposition once enthusiastically ran. No flowers are so truly fertile as those of the cleistogene class, while the nearly allied class of plants which fertilize before the corolla expands are also certainly fertile. The list in these two classes has grown so large as to render the proposition cited untenable.

9. It is conceded now that variety or variation is an essential condition in the order of things,—and that there is no more reason why special forms or colors in flowers should be made dependent on the accident of an insect's visit, than are forms and colors of minerals. The forms and colors of flowers must have had an extensive range had not an insect appeared on the stage.

We must not forget that what we call the kingdom of nature is a vast organization in which a great number of smaller and inferior powers are working apparently independently, but actually in co-operation or accord with the greater ones. No one phenomenon can be fairly placed to the credit of any one direct cause. The forgetfulness of this fact leads to many an error in our theoretical deductions. At any rate the unchallenged propositions I have enumerated, show how many things have to be considered before we accept the wide generalizations presented by those who tell us of the relation of insects to the forms and characters of flowers.

Germantown, Phila.

¹ This proposition is commended to the author of the note on *Cephalanthus*, at p. 66 of this volume.